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CICADAS SEVERELY DAMAGING ASPARAGUS PLUMOSUS*

J. W. WILSON

The growers of so called "ferns" *(Asparagus plumosus)* in the vicinity of Jupiter, Florida have observed for the last two years that the production has been noticeably reduced in quantity. In one "fernery" the plants were dying out so badly that in 1928 they were dug up and Sansavieria planted. Many growers attributed the trouble to the effects of the hurricane of 1928 because the plants never seemed to recover and grow well after the sheds had been blown down upon them. Cast nymphal cicada skins were repeatedly observed in the "fernery" but it was not until 1930 that these insects were connected with the poor condition of the asparagus. In April of this year nymphal cicadas in large numbers were found attached to the roots of the asparagus, and in June specimens were sent to Professor Watson for identification. This is the first time that reports of this insect's attacks on asparagus plants in Florida had been brought to the attention of the Department of Entomology.

The "ferneries" which have suffered injury from the attack of this insect are located at Jupiter, about twenty miles north of West Palm Beach, and as far as is known it is only in this region that the cicada is seriously injuring asparagus plants. The "fernernies" nearest Jupiter are located near Miami about 80 miles south, and as far as is known they are not infested with this cicada. Mr. Schultz at Auburndale reports that he has occasionally observed cast cicada skins in his "fern" sheds at Auburndale but never in sufficient numbers to be a serious menace. Auburndale is about 125 miles northwest of Jupiter, which indicates that cicadas breed in "ferneries" all over the state in very small numbers.

*Contribution from Department of Entomology, Fla. Ag. Exp. Sta.

The "ferneries" at Jupiter are located on both the north and south sides of the Loxahachee River and are usually within one mile of the river, many of them being located near the bank of the stream. The soil on the north side of the river is made up of a coarser sand and contains less humus than on the south side. In addition to being coarser the soil on the north side has a slightly higher elevation, and consequently it is better drained. The "ferneries" on the north side are more severely infested with cicadas at present, although cicadas are present and are causing some damage on the south side of the river. The two "ferneries" most severely infested in 1930 are planted close to the road. The other three sides are enclosed by uncultivated ground, which has scrub oak, pine trees, wire grass, and a number of weeds growing on it. In most cases at least one side of the "fernery" is bordered by an uncultivated field.

The eggs of this species have not yet (Aug. 20) been found although a few adult females have been captured in the fields near the asparagus sheds.

Cicadas taken from beneath the asparagus plants are distinctly divided into three definite sizes which perhaps represent three distinct broods one year apart.

The smallest individual measures about 6 mm. in length and 2.5 mm. in width at the widest point. It is white in color with a light brownish tinge to the large tibiae and tarsi of the first pair of legs. The body tapers from front to back, the end of the abdomen being large and rounded. The antennae are seven jointed and superficially resemble a fourth pair of legs.

The individuals of the intermediate size are dark grey in color with narrow dark brown bands at the posterior border of each abdominal segment, the tibiae and tarsi of the first pair of legs are darker brown, and the second and third pair of legs are very light brown. The head as compared with the remainder of the body is much larger than in the small form, but the abdomen is by far the largest part of the body. The integument of the body is soft and flexible. Wing pads have not begun to appear even on the largest individuals of the brood. The smallest individual of this brood measures 10 mm. in length and 5.1 mm. in width, while the largest individual is 12 mm. long and 6.5 mm. wide.

The full grown nymphal cicada is light brown in color, and the integument is shell like in texture. The wing pads are well

developed. Individuals of this brood vary in length measuring from 17 to 20 mm. and from 9.5 to 11 mm. in width.

The injury to asparagus is caused by the nymphal cicada which is usually found attached to the roots near the crown of the plant. The nymphal cicada grasps the root between the pincher like tibia and tarsus of the first pair of legs and inserts the beak into the root. They remain in this position during the whole of the nymphal stage sucking plant juices from the roots which gradually turn dark and lose all of the lateral feeders. In the case of plants which are severely injured the entire root system dies back to the crown. At this time the effect becomes decidedly noticeable above ground as the plant begins to turn brown and die back. Large areas in many of the "ferneries" are dying back from the effects of the cicadas. In other parts of the "fernery" the plants are small and do not respond to fertilizing or other cultural practices.

It was suggested that this was an accidental infestation resulting from planting asparagus on recently cleared ground since the cicadas have not been previously reported as affecting asparagus. It is improbable that it is an accidental infestation since many of the "ferneries" which have been planted for a number of years have been severely infested with the cicadas. One of the "ferneries" on the Pennock Plantation which had been planted for twenty years was so severely injured in 1928 that most of the plants died. Sansevieria and Pandanas were planted in this shed. The Sansevieria was not affected by the cicadas but the Pandanas did not grow well for the first two years. At the end of two years, however, the Pandanas were large enough that they did not show the effects of cicada attacks. The roots of one Pandana plant were examined on June 28th but no cicadas were found. In another "fernery" on the same plantation the manager reports that in 1929 the number of cast skins left by cicadas emerging from the ground was such that it was impossible to step in the fernery without covering at least six of these cast skins with the foot. This "fernery" had been planted approximately twenty years. Several plants were examined in this fernery and from one to three cicadas were found on the roots of each plant. And yet the plants seemed to be recovering from the effects of the heavy infestation of the previous year. Shed number three on the Pennock Plantation had been planted two years and no cicadas were found in this "ferenery". Mr. Sullivan, whose "fernery" has been planted fifteen years reports that in

1928 large numbers of the cast skins were present in his "fernery". In 1929 there were fewer skins but the "fernery" is still producing only about one-fourth the amount of salable asparagus that it produced two or three years previous to 1928. Mr. Wilkinson states that his three "ferneries" have been planted nine, five, and three years respectively. All three "ferneries" are infested with the cicadas and are not producing as much as one-fourth the amount of "fern" that they should. The "fernery" which has been planted five years seems most heavily infested, and it was placed under cultivation three years before the asparagus plants were set out. A part of Mr. Holmes "fernery" has been set out five years, another part eighteen months, and a third part twelve months. The cicadas have not yet attacked the two younger parts of the "fernery" while they are seriously damaging the older part of the "fernery". It is evident then that the infestation is not accidental since the cicadas are found only on the three year and older plantings.

Several localities outside the "ferneries" were examined to determine the number of cicadas found on plants outside the "fernery" and the kinds of plants attacked. Only three cicadas were found during an afternoon of looking for them outside the fernery. One was found on the roots of wire grass and two on scrub oak roots.

In order to determine the number of cicadas present in the "fernery" ten plots twelve inches square and eight inches deep were examined, and the number of cicadas counted. These counts gave an average of 8.3 cicadas to the square foot; the largest numbers found in two such plots were thirty one and twelve respectively, while two individuals was the smallest number found in a single plot. The number of cicadas found at this time (June 28th) is somewhat smaller than if the counts had been made four weeks earlier as some of the cicadas have already left the ground and emerged from the pupal stage.

This outbreak of cicadas at Jupiter is interesting for several reasons. Although cicadas are generally distributed over the state they have been reported as doing serious damage only in the vicinity of Jupiter. Very little is known about the life history and habits of this species so that much remains to be worked out along this line. Work on control measures has been started and results of this phase of the problem will be reported later.

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BIOLOGY OF THE MEXICAN COTTON BOLL WEEVIL. V.
Diurnal Observations of the Emergence of Boll Weevils From Their Hibernation Quarters[1]

By EDGAR F. GROSSMAN

Conflicting opinions relative to the time of day cotton boll weevils (*Anthonomus grandis* Boh.) emerge from their hibernation quarters led to experimentation to determine, as accurately as possible, whether the weevils quit their winter's resting place during the daytime, the night, or both. Consequently, by recording the exact time each of 1,910 boll weevils were observed to emerge from their hibernation quarters, sufficient data were accumulated to show that practically all of the weevils emerged during the day-time, and that three quarters of the weevils emerging during the day-time did so between 9:00 a.m. and 3:00 p.m. The weevils were observed to emerge from caged-in hibernation material consisting of Spanish moss hung about a branching tree trunk with corn stalks and similar debris packed about the base. The screened cage measured 8 x 8 x 8 feet and was located in a slightly shaded, light woody section of the Experiment Station grounds.

In 1928, observations were conducted inside the cage during the entire day-time of five days, May 12, 16, 18, 20 and June 2, recording the time as each weevil emerged from the moss or corn stalk debris. Twenty thousand boll weevils had been placed in the hibernation cage in October, 1927. By July, 1928, a total of 487 or 2.44% emerged. The number of weevils observed to quit

[1]Contribution from the Department of Cotton Investigations, Florida Agricultural Experiment Station.

TABLE 1.—NUMBER BOLL WEEVILS EMERGING FROM HIBERNATING QUARTERS DURING HOURLY PERIODS.

Hourly Periods	May 12 1928	May 16 1928	May 18 1928	May 20 1928	June 2 1928	Mar. 30 1929	Mar. 31 1929	Apr. 1 1929	Apr. 2 1929	Apr. 11 1929	Apr. 12 1929	Apr. 13 1929	Apr. 14 1929	May 21 1929	May 22 1929	May 31 1929	Totals
Before 6:00 a.m.	15	0	0	3	5	25	0	0	4	9	0	0	26	6	1	21	115
6:00-7:00 a.m.	0	0	0	0	2	4	2	0	0	6	1	1	18	1	1	0	36
7:00-8:00 a.m.	1	2	0	2	18	40	6	3	0	4	3	2	11	1	0	7	100
8:00-9:00 a.m.	4	0	1	0	18	10	7	1	1	25	9	8	3	0	0	4	91
9:00-10:00 a.m.	8	1	1	9	6	17	1	4	7	36	17	52	17	6	2	0	184
10:00-11:00 a.m.	20	0	7	13	24	38	6	7	2	41	27	52	13	10	3	3	266
11:00-12:00 a.m.	20	6	5	3	27	32	12	7	10	19	17	46	26	26	4	30	290
12:00-1:00 p.m.	6	3	0	6	25	49	3	6	7	13	5	24	18	58	4	54	281
1:00-2:00 p.m.	2	5	4	1	13	20	8	4	3	17	16	14	5	44	1	40	197
2:00-3:00 p.m.	2	1	2	0	4	14	10	1	0	5	11	10	20	62	5	9	156
3:00-4:00 p.m.	4	2	2	2	3	9	4	12	0	8	14	5	5	36	2	0	108
4:00-5:00 p.m.	3	3	1	5	0	2	7	3	0	6	9	3	0	10	0	0	52
5:00-6:00 p.m.	0	0	0	1	0	4	3	5	0	2	12	3	2	1	0	0	33
6:00-7:00 p.m.	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Totals	86	23	23	45	145	264	69	53	34	191	141	220	164	261	23	168	1910

hibernation (322) was considered to be too small to be significant, though the curves drawn for each day's emergence agreed with each other in direction and slope.

In order to substantiate the emergence trend of 1928, observations were conducted in the cage for eleven additional days in 1929, March 30, 31, April 1, 2, 11, 12, 13, 14, May 21, 22 and 31. Of the 20,000 weevils placed in the hibernation cage in October, 1928, 5,736 or 28.68% emerged by August, 1929. Of this number 1,588 emerged during the eleven days the cage was under continuous observation. Combining the data secured in 1928, and 1929, a total record of sixteen days of observations was available. During this time 1,910 weevils were observed to emerge from hibernation.

Individual boll weevils emerging from their hibernation quarters have been grouped into hourly periods, starting at 6:00 a.m. and continuing until 7:00 p.m. Though the cage was first visited at 4:00 a. m. experience showed that searching for the weevils by the aid of a pocket flash-light was unsatisfactory and the cage was subsequently visited just before day-light and occupied until dark. Table I presents the number of weevils emerging hourly, and Table II presents the same data arranged, however, in cumulative percentages.

May 12, 1928, March 30, April 2, 14, and May 31, 1929, show a considerable percentage of weevils emerging during the night, i. e., after 7:00 p.m. and before 6:00 a.m. Though the night of May 11, was warmer than the three preceding nights and though there was a trace of rainfall on May 11, following two dry days, neither the rainfall nor temperature can be held attributable to any great extent for the night emergence occurring before 6:00 a.m., May 12, 1928. It is possible that some of the weevils were overlooked and consequently not removed when the cage was examined late in the evening of the previous day. Thereafter care was taken to avoid repetition of this possibility.

The night emergence reported on March 30, followed a relatively warm March night, minimum temperature 63° Fahrenheit, and a smaller range of maximum-minimum temperatures, 21 degrees, than had occurred during the five previous days. Any outstanding effect the temperature or rainfall had on this night emergence is questionable. The over-night emergence recorded for April 2 followed a minimum temperature of 65° Fahrenheit, seven degrees higher than that of the preceding night. There had been no rainfall. April 14 showed a still greater correlation

TABLE II.—SAME DATA AS THOSE PRESENTED IN TABLE I, ARRANGED, HOWEVER, IN CUMULATIVE PERCENTAGES.

Hourly Periods	May 12 1928	May 16 1928	May 18 1928	May 20 1928	June 2 1928	Mar. 30 1929	Mar. 31 1929	Apr. 1 1929	Apr. 2 1929	Apr. 11 1929	Apr. 12 1929	Apr. 13 1929	Apr. 14 1929	May 21 1929	May 22 1929	May 31 1929	Avge.
Before 6:00 a.m.	17.44	0	0	6.67	3.45	9.47	0	0	11.76	4.71	0	0	15.85	2.30	4.35	12.50	6.02
6:00-7:00 a.m.	17.44	0	0	6.67	4.83	10.98	2.90	0	11.76	7.85	0.71	0.45	26.83	2.38	8.70	12.50	7.90
7:00-8:00 a.m.	18.60	8.70	0	11.11	17.24	26.13	11.60	5.66	11.76	9.94	2.84	1.36	33.54	3.06	8.70	16.67	13.14
8:00-9:00 a.m.	23.25	8.70	4.35	11.11	29.65	29.92	21.74	7.55	14.70	23.03	9.22	5.00	35.37	3.06	8.70	19.05	17.90
9:00-10:00 a.m.	32.55	13.05	8.70	31.11	33.79	36.36	23.19	15.10	35.29	41.88	21.28	28.64	45.74	5.36	17.40	19.05	27.53
10:00-11:00 a.m.	55.81	13.05	39.13	60.00	50.34	50.75	31.89	28.31	41.17	63.35	40.43	52.28	53.67	9.19	30.44	20.84	41.46
11:00-12:00 a.m.	79.07	39.14	60.87	66.67	68.96	62.87	49.28	41.52	70.57	73.30	52.49	73.19	69.52	19.15	47.83	38.74	56.64
12:00-1:00 p.m.	86.05	52.18	60.87	80.01	86.20	81.43	53.63	52.84	91.16	80.11	56.05	84.10	80.50	41.37	65.22	70.88	71.35
1:00-2:00 p.m.	88.38	73.92	78.26	82.23	95.17	89.01	65.22	60.39	100.00	89.01	67.40	90.46	83.55	58.23	69.57	94.68	81.66
2:00-3:00 p.m.	90.71	78.27	86.96	82.23	97.93	94.31	79.72	62.28	.....	91.63	75.20	95.01	95.74	81.98	91.31	100.00	89.83
3:00-4:00 p.m.	95.36	86.97	95.66	86.67	100.00	97.72	85.52	84.92	.....	95.82	85.13	97.28	98.79	95.77	100.00	.....	95.48
4:00-5:00 p.m.	98.85	100.00	100.00	97.78	.....	98.48	95.66	90.58	.....	98.96	91.51	98.84	98.79	99.60	.....	.....	98.20
5:00-6:00 p.m.	98.85	.....	.....	100.00	.....	100.00	100.00	100.00	.....	100.00	100.00	100.00	100.00	100.00	.....	.....	99.93
6:00-7:00 p.m.	100.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	100.00

between warm nights and night emergence. The minimum temperature during the night did not fall below 67° Fahrenheit, thirteen degrees higher than that of the preceding night. There was no rainfall. May 31, on the other hand, indicated that, with a period of fairly constant minimum night temperatures (66° to 68° Fahrenheit) rainfall occurring during the previous day tended to stimulate night emergence. These five cage days indicate that warm nights and rainfall following drought might possibly stimulate night emergence. The other eleven days spent in the hibernation cage showed but little, if any, night emergence. These days were not preceded by temperature changes nor by rainfall, with the exception of March 31, and May 22, 1929, which were preceded by 0.09 and 0.34 inches rainfall and no emergence and a small percentage emergence respectively. Of the number weevils emerging, a total of but 115 weevils or 6.02% emerged, however, during the night-time.

A graph of the total number of weevils emerging during the sixteen days of observations conducted in the hibernation cage is presented in figure 1. The curved line indicates a cumulative percentage record of the observed hourly rate of the emergence of the boll weevils from their hibernation quarters. This line becomes more significant when compared with the straight line which represents an uninfluenced theoretical rate of emergence, namely, the same percent emergence during each of the twenty-four hours per day. It is interesting to note that, of the 1,910 weevils observed, 1,795, or 94%, emerged during the day-time and that 1,374, or 76.5% of the weevils emerging during the daytime did so between 9:00 a.m. and 3:00 p.m. Narrowing the period of emergence to four hours, 10:00 a.m. to 2:00 p.m., 57.6% of the day-time emerged weevils quit hibernation.

It was thought that sunshine might have stimulated the emergence between 9:00 a.m. and 3:00 p.m., and that more intense sunshine activated the increased emergence rate noted to occur between 10:00 a.m. and 2:00 p.m. Experiments were designed, therefore, to determine whether or not sunshine affected boll weevil emergence.

Groups of one hundred hibernating boll weevils were placed in the center of each of a number of closely packed Spanish moss balls. The individual balls measured about four inches in diameter and weighed about ten ounces. The weevil-containing balls were then placed into a low temperature incubator for several days, the temperature being held at 55° Fahrenheit. This was

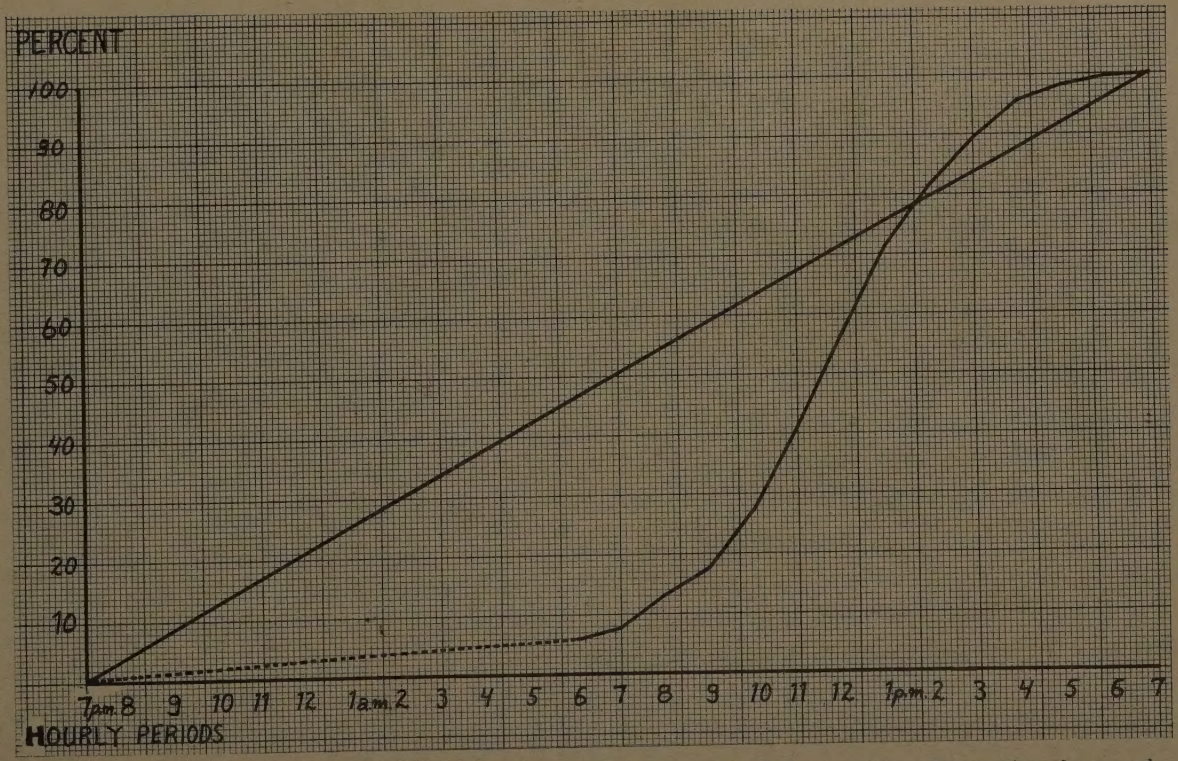

Figure 1. Graph comparing the observed hourly rate of the emergence of boll weevils from hibernation, the curved

done to insure a return to hibernation, which condition was necessarily interrupted while transferring the weevils to the moss balls.

The balls were removed from the incubator in pairs, and were placed in screened 4 x 4 x 5 foot cages, one cage being shaded and the other exposed to sunshine. As the weevils emerged from the moss balls they were recorded, the records being summarized in Table III. A total of 2,357 weevils were used for observing

TABLE III. — COMPARISON OF BOLL WEEVIL EMERGENCE FROM SPANISH MOSS BALLS PLACED IN THE SHADE AND IN THE SUN RESPECTIVELY.

Moss Balls	Days Kept at 55° F.	No. Weevils Used	Average Emergence Temperature	Percent Weevils Alive	Percent Weevils Emerged
In Shade	12	75	70° F.	71.42	62.50
In Sun	12	75	70° F.	54.05	80.95
In Shade	11	71	75° F.	54.92	77.14
In Sun	13	75	75° F.	64.38	61.53
In Shade	7	100	77° F.	83.87	31.57
In Sun	7	100	77° F.	85.56	38.46
In Shade	8	104	79° F.	42.30	100.00
In Sun	8	100	79° F.	47.00	92.85
In Shade	3	100	82° F.	94.94	38.50
In Sun	3	100	82° F.	90.00	56.81
In Shade	4	100	82° F.	100.00	68.00
In Sun	4	100	82° F.	88.88	78.94
In Shade	9	100	82° F.	50.00	59.25
In Sun	9	100	82° F.	27.58	82.60
In Shade	11	89	82° F.	67.04	84.21
In Sun	11	100	82° F.	51.00	86.20
In Shade	10	100	82° F.	35.55	78.94
In Sun	10	100	82° F.	48.00	100.00
In Shade	10	100	84° F.	38.14	83.33
In Sun	10	100	84° F.	65.00	69.44

the rate of emergence from twenty-seven moss balls. The condition of the weevils used for these tests is indicated by that column in Table III which presents the percent weevils alive at the end of each test.

At times weevils emerged faster from the shaded moss ball than from the one exposed to sunlight. As often, however, emergence from the moss ball in the sun was faster than from the shaded ball. Though a greater number of weevils, 74.78%, emerged from the sun-exposed moss balls than from the shaded ones, 68.34%, the difference is not significant enough to indicate that sunshine is a direct means of stimulating boll weevil emergence.

When, in addition to the information presented in this paper, one considers that, of 20,000 boll weevils placed in hibernation quarters, individuals emerge from hibernation daily from March 1 to the middle of July every year regardless of the variable temperature, periods of rainfall and drought, it appears that when the boll weevil is physiologically prepared to quit hibernation, it does so, daylight, temperature increases, and rainfall hastening the process but slightly.

A NEW FOOD PLANT OF THE BUCKEYE BUTTERFLY

A. N. TISSOT

This very pretty butterfly (*Junonia coenia*, Hubner), is now rather numerous in the vicinity of Gainesville. Holland in his "Butterfly Book" mentions that the larvae feed on various species of *Plantago, Gerardia* and *Antirrhinum*. A review of the available literature failed to reveal mention of any other food plants of the butterfly so it is of interest to note that numerous larvae of this species have been found during the month of August feeding on one of the wild asters, *Aster* sp. Two collections of the larvae were taken from localities about fifteen miles apart and in opposite directions from Gainesville. *Antirrhinum* grows only under cultivation and as no larvae of *coenia* were observed on *Gerardia* it seems quite probable that the asters play the role of principal host plant for this species of butterfly in central Florida where the plantains are almost entirely absent at this time of the year and are never abundant.

NOTES ON UTAH COLEOPTERA

GEO. F. KNOWLTON

(Continued from page 39)

Epicauta vittata Fab.
Logan (Titus); Richmond, August 7, 1912 (Titus).

Epicauta oregona Horn
Monroe, July 25, 1906 (Titus); Salt Lake City, June 30, 1927 (Knowlton); Snowville, August 5, 1929 (Knowlton).

Macrobasis albida (Say)
Salt Lake City, July 20, 1923 (Knowlton).

Lytta vulnerata (Lec.)
Cache Junction, August 5, 1910 (Titus); Howell, August 5, 1929 (Knowlton); Lampo, August 5, 1929 (Knowlton); Logan, September 2, 1907 (Titus).

Lytta nuttalli Say
Fish Lake, June 28, 1926 (Knowlton).

Lytta cyanipennis Lec.
Fish Lake, June 28, 1926 (Knowlton).

Zonitis flavida Lec.
On beets at Delta, July 15, 1926 (Knowlton).

Nemognatha dichroa Lec.
Garland, August 5, 1924 (Knowlton).

Nemognatha punctipennis Lec.
Grantsville, August 15, 1929 (Knowlton); Iosepa, August 27, 1929 (Knowlton); Promontory, August 22, 1929 (Knowlton); Timpie, August 13, 1929 (Knowlton).

Family ELATERIDAE

Chalcolepidius webbi Lec.
St. George, 1919 (Morris).

Aeolus comis (Lec.)
Logan, April 2, 1906.

Aeolus dorsalis (Say)
Stansbury Island, June 13, 1913 (Pack, Hagan, and Titus).

Limonius infuscatus Mots.
Logan, April 6, 1910.

Pheletes californicus (Mann.)
Logan, August 1924 (Knowlton). Also collected at Sacramento, California, April 29, 1908 (Ball).

Ludius resplendens (Esch.)
Logan, July 22, 1904.

Ludisu inflatus (Say)
Logan, June 3, 1912 (Hagan).

Hemicrepidius carbonatus Lec.
Lewiston, June 1924 (Knowlton); Logan, June 15, 1923 (Knowlton).

Elater phoenicopterus Germ.
Clarkston, June 15, 1927 (Pack).

Megapenthes turbulentus (Lec.)
San Margareta, California, August 6, 1912 (Ball).

Cardiophorus tumidicollis Lec.
Franklin, Idaho, May 24, 1923 (Knowlton).

Cardiophorus tenebrosus Lec.
Logan, April 24, 1910.

Family BUPRESTIDAE

Acmaeodera sparsa Horn
Ontario, California, June 12, 1908 (Ball).

Acmaeodera ornata (Fab.)
Logan.

Acmaeodera variegata Lec.
Mill Creek, June 7, 1908; Salt Lake City, July 2, 1908 and May 29, 1909 (Titus); Stockton, 1916 (Call).

Acmaeodera pulchella (Hbst.)
Logan, July 23, 1907.

Hippomelas planicosta (Lec.)
St. George, 1919.

Hippomelas obliterata (Lec.)
Moab, August 10, 1906; Thompsons, August 9, 1906.

Chalcophora angulicollis (Lec.)
Lewiston, July 12, 1929 (Knowlton); Newton, July 10, 1929 (Knowlton); Salt Lake City, July 28, 1923 (Knowlton).

Dicera tenebrica (Kby.)
Logan, June 22, 1924 (Knowlton).

Buprestis aurulenta L.
Lewiston, July 1927 (Knowlton); Utah State Agricultural College Campus, Logan, July 8, 1920 (G. E. King).

Buprestis maculativentris Say
Bryce Canyon, August 20, 1929 (Dowdle); Logan, October 1926 (Knowlton).

Buprestis fasciata var. **langi** (Mann.)
Wellsville Canyon, August 1922 (Knowlton).

Melanophila acuminata (De G.)
Lewiston, July 8, 1923 and July 1925 (Knowlton); Logan, July 4, 1923 (Knowlton); Murray, June 20, 1913; Slaterville, July 5, 1927 (Knowlton).

Anthaxia aeneogaster Cast.
Mt. Logan, July 10, 1908 (Horton). Also collected at Salinas, California, April 26, 1908 (Ball).

Chrysobothris mali Horn
Ontario, California, June 12, 1908 (Titus); San Diego, California, May 1, 1916 (Titus).

Chrisobothris femorata (Oliv.)
Kaysville, September 17, 1925 (Knowlton); Logan.

Agrilus walsinghami Cr.
American Fork, August 18, 1903.

Agrilus niveiventris Horn
Logan.

Agrilus politus (Say)
On willow at Bountiful, May 29, 1929 (Pack).

Agrilus gibbicollis Fall.
Stansbury Island, June 13, 1913 (Pack, Hagan and Titus).

Family DERMESTIDAE

Dermestes compactus Csy.
Stansbury Island, June 13, 1913 (Pack, Hagan and Titus).

Family CUCUJIDAE

Oryzaephilus surinamensis (L.)
Logan, July 1929 (Knowlton).

Cathartus advena (Waltl.)
Logan, September 3, 1929 (Pack).

Cucujus clavipes Fab.
Logan, May 28, 1917.

Family TENEBRIONIDAE

Tribolium confusum Jacq.
Logan, December 1928 (Knowlton).

Tenebrio molitor L.
Utah State Agricultural College granary, Logan, September 7, 1929 (Pack).

Family SCARABAEIDAE

Aphodius granarius (L.)
Lewiston, June 24, 1924 (Knowlton).

Aphodius distinctus (Mull.)
Logan, September 28, 1922 (Knowlton).

Lachnosterna sp.
Larvae damaging sugar-beets in a few fields at Benson and Trenton, 1925 (Knowlton).

Polyphylla decemlineata (Say)
Logan, June 1923 (Knowlton); Hinckley, July 17, 1914.

Xyloryctes satyrus (Fab.)
St. George, 1919.

Family CERAMBYCIDAE

Prionus californicus Mots.
Bountiful, September 9, 1929 (Pack and Janes). Also collected in the Kaibab Forest, Arizona, August 23, 1929 (Dowdle).

Spondylis uniformis Mann.
Logan.

Asemum atrum Esch
Logan, July 9, 1904.

Criocephalus productus Lec.
Logan, August 5 and September 10, 1903.

Criocephalus asperatus Lec.
Logan, August 10, 1910 (Titus).

(To be continued)

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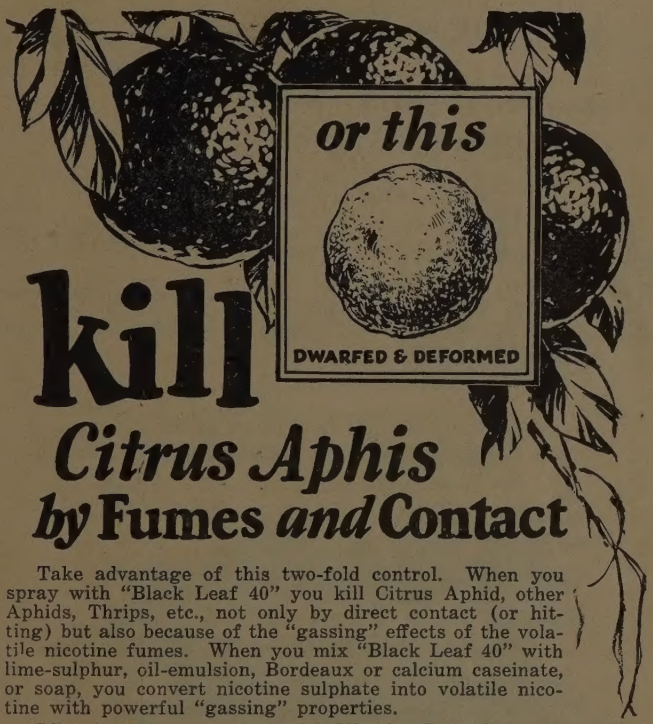

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